# Cartoon in the Classroom

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THE FIRST words I heard at the Disney studio were, "But how does the horse get in the bubble?"

Screwy, yes, but significant—significant enough to indicate a future usefulness for this wacky and wonderful cartoon industry that may rank with the greatest things it has done in the past. For that theatrical phrase dissolves into a parallel of some promise to the field of education, namely, "But how does the verb get in the sentence?"

The cartoon, of course, has been a powerful educative force ever since artists roughed out their stuff with sledge and chisel. The spot cartoon, political or humorous, has always been a form of frozen animation, distilling a whole sequence of action or character into a single significant moment. The comic strip added an element of progression in the making of a point. But the comparatively recent development of filmed animation, and the still more recent embellishment of sound, have brought into being a truly new teaching tool—a tool which, when the medium is properly used and its philosophy is understood, can clarify and make rememberable many vital things which hitherto have been difficult to impart by traditional methods.

The educative possibilities of live-action film are reasonably apparent, and, regardless of one's opinion of the existing library, pretty well explored; those of cartoon animation are not so apparent, and need a good deal of exploration. And while an article of this length can do no more than make a brief run over the terrain, perhaps we can take a preliminary sight on the function of the animated cartoon in the teaching process by first delineating its field from that of live action.

Although only a theorist would deny an area of overlap, the fields of the two media are rather clearly marked. Fundamentally: *the live-action camera represents the physical eye,* and *the animation camera represents the mind's eye.* Live action will reproduce anything that can be seen; animation, anything that can be imagined.

Parallel to the difference in philosophy between a photograph and a caricature, live action can show superbly how things *look,* whereas animation can show what they *mean.* Taking off from physical reality as a starting point, animation can project a point until it actually becomes "truer than truth," as is exemplified in Disney's film, *Jet Propulsion,* wherein the conventional airplane propeller dissolved into a giant bit that visually "bored" its way through a materialized atmosphere.

There is no implication here that animation is "better" than live action, any more than Vitamin D is "better" than Vitamin $B_1$. Each of the media has powers peculiar to itself; each field is vital, and rich in potential.

Now, and in the foreseeable future, much of the schools' curricula will be rightly concerned with the facsimile physical and social aspects of the world in which the students will live. In this broad field, live action is unchallenged. But to clothe these facsimiles with significance and relevancy, the students must achieve a comprehension of the great body of intangibles which underlie them—the abstractions, ideas, concepts, and principles. Many or most of these intangibles, at least if the subject is to be truly visualized rather than primarily talked about, fall in the field of animation.

The existing library of educational film leans heavily toward live action. It is also heavy on the side of facsimile and fact, and light on abstracts and principles. It presents much "what," some "how," but very little "why." This condition is natural enough. No writer or producer would feel any qualms about embarking on a picture about, say, the Port of New York. But the same writer, if asked to find a way to build a film on Algebraic Subtraction, would justifiably feel that there must be an easier way of earning a living. On some subjects you obviously can make a picture; on others you can't. Animation's richest field includes the pictures that "can't" be made.

Actually, there is no jurisdictional dispute between the two media. Each can do something the other cannot. And the result is that they are complementary. For example, a Disney film on musical instruments plans to alternate freely between the media: live action will show with maximum identification and validity what the physical instruments look like and how they are played; and animation will visualize the invisible principles by which the generic instruments produce and control the vibrations which reach the hearer as musical tones. The animated maps of *The Amazon Awakens,* which showed why the area developed as it did, dissolved logically into the live-action "what" of the locale and its people. Neither medium could have fully developed either subject by itself.

This general conception of animation as the physical expression of the imagination, unfettered by the finite, manifests itself in certain definite and highly promising channels. Specifically, the film teachers can manipulate the medium to do the following:

1) *Solidify the intangible.* Before I went with Disney, I subscribed to the live-action truism that "You can't take a picture of a thought." But in the propaganda film *Reason and Emotion* Disney moved his camera right inside a character's brain to play spectacled Reason against caveman Emotion in a vivid conflict which rendered an abstract psychological principle into a comprehensible and rememberable concrete. In illustration of economics, a "marginal man" can spin off the whirling turntable of Cost. . . . Concrete pictures can answer the abstract questions of what a Tax is, and why we need Law. . . . "Time" can pass in full view.

2) *Visualize the invisible.* Invisible objects and forces can be materialized into visible forms symbolic of their invisible inner natures. Sound waves, light waves, vibrations, nerve impulses . . . radiations, magnetic fields, centrifugal forces, the pull of gravity . . . chemical components, the gases of the atmosphere, odors, tone colors . . . the composition and rearrangement of a

hydrocarbon molecule. One forthcoming film even makes a pretty fair try at visualizing infinity.

3) *Animate the inanimate.* Chromosomes can choose their partners, digits struggle to escape the captivity of a plus sign, musical notes change places on a chord ladder, adverbs literally modify their verbs, nouns change appearance as they don their adjectives, and the sides of an equilateral triangle fold up like a clothes dryer to demonstrate their equal lengths.

4) *Re-create physical objects which are extinct, inaccessible to the camera; or depict the "future."* The infinite scene dock stored at the tip of the artist's pencil can rebuild the Pyramids, invent the wheel, reënact the Ice Age, bring back the dinosaurs for a return engagement (remember the Rites of Spring sequences in *Fantasia*?), rebuild the land bridges which once connected the continents and people them with the migrations of long-forgotten races. The animator can examine marine life miles below the deepest descent of the bathysphere and lift a square mile of sea water from its enveloping ocean to separate its chemical constituents. He can delve under the earth to get a focus on hidden geological strata: he can trace the path of underground springs, show why they flow, and demonstrate their relationship to the water table. He can soar into space to explore the Milky Way, and bring the vast solar system into comprehensible scope. The smoking cloud of a volcano does not obscure his view, nor does the flesh of the body conceal its bone structure. And his preview of things to come, the World of Tomorrow and its ways, is limited only by the creator's capabilities in imagination.

5) *Broaden the personal, and generalize the specific.* Some of the very direct subject matter in Disney's *Story of Menstruation* could have been offensive and indelicate if presented in terms of a living actress. In the same producer's *Dawn of Better Living,* had the house in which the action centered been an actual house on an actual street, it would have carried no identification factor to most of the audience. *The Brotherhood of Man* in live action would have tended to probe its broad problems in terms of individual actors' personalities rather than of universalized races. The peculiar power of animation to depersonalize, and to generalize, permits the medium to present such broad problems in terms of their full scope.

6) *Characterize and symbolize.* In the hands of a truly creative (and conscientious) craftsman, this power goes far beyond the elementary stage of painting arms and legs on a pill and calling him Victor Vitamin. Truly creative thinking can "characterize" an object or force or idea in such a truth-projected fashion that the essence of its inner nature can be brought out as a visual, dominant, characteristic: The animated sound track in *Fantasia* was the principle of vibration "in the flesh." Unreasoning objects or forces can be significantly motivated: greedy black cancer cells can thrust their way through the blood stream with frightening malevolence . . . midget Vibration can sting giant Resonance into reinforcing his feeble cry. An eager little locomotive can push back the wilderness and drop off its load of civilization in its wake. And when it is necessary to anchor a point with a rememberable symbolic image, a radio antenna can

cock an attentive ear . . . migrating tribes can be viewed from afar as plodding lines on the sphere of the world . . . dark clouds of "irregularity" can blot out a cosmic sun dial. Incidentally, within this power of characterization lies one secret of animation's ability to gild clarity with interest-holding "entertainment," especially that touch of indigenous humor which may make a point more rememberable than the straight treatment. True, this power is often misused. But it need not be if the maker will avoid the easy interpolations, and, by the fresh but logical manipulation of props which must be on the screen anyway to make his point, keep his "roots in truth."

7) *Distill and depict "process."* Live action can achieve some extraordinary results with montage, matched dissolves, fast and slow cranking, time-lapse photography, and stop motion. But where the subject demands it, animation can go beyond any of these techniques to show a process in its complete, flowing, step-by-step continuity, manipulating the several powers described above to distill the process to its simple essence and present it with its basic meaning and rememberable significance. A flat geometric area can expand into a cube as we watch. A blueprint can grow into a house. Oil-bearing sands can be laid down through the ages. A violin can evolve from a warrior's bowstring. Glands can function and food be digested. Moisture can evaporate and condense. A vote can lead a parade up through the levels of representative government until it compels the ratification of a treaty.

So much for the main powers of the animated medium. There are others, many others, but they are implicit in those which have been sketched.

These powers, extraordinarily flexible, can be manipulated by the film teacher to build a story structure on any one of the three common treatment bases. By the *direct approach,* for example, "things which are equal to the same thing" can be superimposed to show that they are "equal to each other," and the shell of a gasoline engine stripped away to show the working cycle of a diagrammatic piston. By the *dramatized treatment,* an aggressive Demand and a coy Supply can find their tug of war umpired by a fluctuating Price. But it is probably in the field of *analogy* that the powers of animation find their most effective expression.

In the realm of the abstraction or principle, if a picture is worth a thousand words, a convincing and compelling analogy may be worth five thousand. It identifies the new subject with something already accepted by the viewer, understood by him, and included in his inventory of experience; it introduces the unfamiliar in terms of the familiar. And of course the imaginative analogy is animation's meat.

In animated analogy, for example, the force of gravity becomes a magnet; disease germs become invading armies which infiltrate the body's defenses; a cyclotron is overlaid with a target range; the musical overtones may be characterized as acrobats, who perform on the trapeze of a vibrating violin string. Disney's film, *Sight,* after animating by direct approach the actual operation of the human eye, paralleled the same action in terms of a Kodak analogy; and then, to draw the conclusion visually on the screen rather

than verbally in the narration, the artist used his peculiar power to link animation and actuality together in the same scene and superimposed the operating camera upon the similarly operating eye. When the short sequence was finished, the animated analogy had embedded an unfamiliar abstraction in the concreteness of the viewer's own familiar life experience.

At this point, one thing must be admitted. So little animated educational footage has been produced that the possibilities listed above are more in the nature of forecast than recapitulation—campaign promises. However, the candidate can point to his excellent record in the theatrical field to indicate with considerable validity that certain proved treatment techniques, inherent in the medium and practically peculiar to it, can be expected to implement the powers he claims for teaching.

These techniques are, in the main, the following:

A) *Selection.* Whereas the live-action director must accept things in some degree as he finds them, the animation artist has complete discrimination with respect to what he shall "stage." He can eliminate or subordinate any cluttering environment in order to spotlight the significant essence of the point at issue. A symphony score can distill its theme; blood wipes away to disclose the surgeon's operation; a paragraph fades off behind its punctuation.

B) *Simplification* permits the animator to strip the mathematical complexities from our acrobats of the harmonic series and show only their significant interval relationships to the fundamental tone, or to reduce an intricate turbine to the comprehensible simplicity of a water wheel.

C) *Accumulation* enables the film teacher to start with a base element and add others, each "related" as it enters the screen, until a completed assembly has been made comprehensible both in fraction and in sum. Bones can grow into a man, tubes and valves into a trumpet, blueprints into a machine, parts of speech into a sentence. And when the technique is reversed in the process of *Subtraction,* a gasoline engine reduces part by part to its crankshaft (to demonstrate the conversion of reciprocating motion to rotary), and a musical Bambi discards his "personality" of melody and his "flesh" of harmony to lay bare his skeleton of rhythm.

D) *Exaggeration,* the teammate of Selection in the art of caricature, permits the placing of emphasis and accent exactly where the teacher wants it. There need be no doubt, in a film on Heredity, concerning which characteristics are dominant and which recessive; no narrator need tell the audience what to watch, for the point is on the screen where it belongs, heightened by exaggeration into an unmistakable and rememberable conclusion. A lever can visually move a mountain. Geometrical progression can fill a universe with "doubled" objects in the twinkling of a sequence.

E) *Juxtaposition* eases the visualization of contrasts and relationships. The juxtaposition can be horizontal, wherein a stagecoach and a locomotive may appear side by side to fight their battle for economic supremacy. Juxtaposition in depth is the old technique of superposition, whereby an isosceles triangle can be laid upon its equilateral brother to demonstrate their differences. And juxtaposition in progression makes possible that flowing-continuity,

unbroken "montage," discussed a moment ago, which is so useful in portraying the various sorts of evolutionary processes.

F) *Penetration* is animation's well-known X-ray eye. But it can now go beyond the old cutaway technique and, particularly where the Multiplane camera is available, permit the simultaneous staging of multiple levels. The animator can view internal combustion from inside the cylinder walls, examine a sphere from its center, reduce hidden strata to cross section, and explore any organ of the human body not only in rendered perspective but in multiple-level relationship to the other organs.

G) *Mutation,* used principally as a means of projecting reality to fantastic analogy, is not nearly as esoteric as it sounds. Every theatergoer is conditioned to seeing cartoon eyes turn into binoculars, hands transmute into pliers, a cannibal's victim into a hot dog, and so on. It is not really a far step from this sort of thing to the transmuting of a blowtorch into a rocket motor, a cold front into a snowplow, or a numerical fraction into moving proportional shapes.

Of the many other techniques, only four would seem to rate mention in this brief article. *Manipulation* lets us sort and reassort our props and move them about: mountains rear themselves and rivers begin to flow on animated maps; the digits in a simple-division equation are manipulated into a fraction; a straight column of air is twisted into the loops of a tuba. *Dramatization* helps make our points with vivid rememberability: an overloaded fuse does an Edgar Kennedy burn before it finally blows; a tactile impulse races its message up through the nervous system; an excited exclamation point shoves a querulous question mark off the cliff at the end of a sentence; verbs become visually active or passive. The *Stock devices* of the animator—dynamic diagrams, labels, dotted lines, arrows, circles, superimposed magnifying glasses, footprints, action graphs, and whatnot else—implement the direct approach with clarity. The *Symbolized sound* of a grunting lever, a yawning digit, or a predatory verb roaring at its object broadens the image beyond the boundaries of the frame to heighten its rememberable significance. These techniques are almost invariably used in combination, and any given short film will usually contain at least a hint of all of them.

And finally, to complete the tool kit: in that area where live action and animation overlap, the two media can be effectively *combined* in the same frames. It is a natural progression from the live Edgar Bergen fainting at the sight of the cartoon Giant in *Fun and Fancy Free* to the adaptation of the same technique to teaching applications, wherein teachers ask us to screen such principle-fact combinations as an animated Friction grinding sandpaper against a live-action bearing, animated impressions entering a live boy's eyes and ears and emerging from his live mouth as animated words, animated sound waves spreading in an expanding sphere from a live-action orchestra, a live workman leaving a trail of animated footprints behind him (thus transforming a "time form" into a "space form"). This combination technique is expensive, but in certain rugged spots will justify its cost.

It is almost laboring the point to conclude that the sum of all these peculiar

powers and techniques is a new kind of entertainment—functional entertainment. This, in competent creative hands, is entertainment in its strict sense of legitimately attracting and sustaining active audience interest in the subject at issue. And this faculty of functional entertainment permits a fresh, interesting, appealing, and rememberable treatment of abstract subjects which in other media of mass communication would tend to be dull.

In terms of its very real potential, animation for teaching purposes, like all teaching film, is now in an embryonic stage. The serious danger to its future utilization is that it may be used more widely than wisely, and that it will be used too much; more specifically, that it will be applied outside of its proper area.

The animated medium should not be regarded as a sort of universal wrench which turns all nuts. Any attempt to invade live action's field of facsimile realism is an invitation to miss a boat; the resulting picture loses the essential identification and validity of live action and costs a lot more. Other subjects simply do not need animation or motion techniques of any kind, but animation may be forced in where slide films or static diagrams would have been perfectly adequate for the job at hand.

And even when a subject legitimately requires the use of animation, there are many pitfalls along the creative path. There is a constant temptation, in framing the story, to sell out cheap, to do it the easy way rather than beat one's brains out distilling the concept and images to that utter and complete simplicity of telling which the medium requires. It is easier to stuff in an interpolated gag than to search out the indigenous bit of fresh business; easier to use tricks than truth when a "clever" matched dissolve can cover a bothersome hole in the logic; easier to use a multiplicity of images, with consequent loss of unity and single impression; easier to use the images that come first to mind but are apt to be unfamiliar to the audience (the seismograph dial vs. the ripples on a pool) than to keep probing for the apt image that will establish its significance instantly.

Immigrants from other media fall for the temptation to use subtlety in a field where clarity is paramount; to overload the characters with gab in a medium which, lacking soft bosoms and hard shoulders to sustain interest under lengthy dialogue, must keep its characters so constantly in interesting motion that the word "No" is a fat line. There is a tendency to duck the monotonous detail of story work which resolves the back-and-forth progressions into a straight story line, reduces to order the confusion of multiple dissolves, and cuts in the inevitability of honest logical sequence which automatically insures smooth pictorial flow.

A successful result in animation demands more in the way of creative ability, intuitive feeling for the philosophy of the medium, ability to think in images rather than words, and downright years of practical working experience in its techniques, than any other mode of mass expression.

Actually, these and the many other "limitations" are encouraging. For, in cartoon animation, the screened result of incompetence, slackness, happy amateurism, or unshowmanlike theoretics is a picture which fails more embarrassingly than a live-action film. In fact, the

penalty of failure is so spectacular that it practically compels a functioning answer to the educators' demand that our films truly "identify, simplify, clarify, and make rememberable" their subjects. All this leads to the end result that animation, through its extraordinary faculty of direct statement and its peculiar power to concretize the abstract, can lift the burden of the message from the "telling" sound track and move it up on the "showing" screen, thereby, since the ear forgets but the eye remembers, introducing new factors of comprehension and retention which may take on appreciable importance for the teaching processes of the future.

Well, granted that animation can do all these things that are claimed for it, why has it been used so little; not much more than a token footage in the whole broad field of factual material? Partly, it is because the vital pool of trained and able talent is definitely limited and not quickly expanded. This is a business of old hands, and the basic creator, the true "visualizer," is a rare animal. It is not enough to hand a narration or outline, conceived in terms of words rather than images, to an artist and ask him to illustrate it; an animated story must be conceived and executed, right from the germ stage, *in the medium.*

Partly, too, it is a matter of higher negative cost. Some of these costs are inescapable. Story costs are higher, for a visualized story takes more time to work out than the verbal approach. Production labor costs are high, for animation is a custom "handmade" operation. True, there are legitimate ways of cheating some of this cost, especially on educational film. Expensive character animation can be minimized in favor of diagrammatic portrayal, or symbolized by less expensive silhouettes and shadows; scenes can be planned so that they open on the high point of the action, omitting animated build-up, and then use animation only in the significant corner of the scene, against held backgrounds; animation can be "cycled" or replaced by sliding cells, and an illusion of animation can be inexpensively achieved by moving the camera over a still background.

The final answer to the cost problem, however, lies in an expanded distribution. Now, in an undeveloped market, animation's higher negative cost must be spread over a comparatively few prints. But in the United States alone (and the animated film, being essentially visual and "silent," is intelligible all over the world) there are more than 100,000 electrically serviced schools of more than one room, a market which may eventually justify print orders in the thousands. Merchandising experience in other industries indicates that when we offer the schools good films on got-to-see subjects, films that help to teach *essential* things *better* and *faster,* and therefore *cheaper,* animation will begin to convert its own abstract potential market into a concrete one. And the budding nontheatrical audience, already spending heavily in other media of self-improvement, may welcome animation's answer to its demand for entertainingly presented information.

In the past few months, Hollywood has periodically been reading the Requiem over the animation industry. Hat on breast, it waits reverently at the yawning grave. But no funeral is complete without a body, and nothing is dead which promises to fill a vital, universal, and urgent need.